WEST AFRICAN SENIOR SCHOOL CERTIFICATE EXAMINATION
CORE MATHEMATICS

PAPER 2

SECTION A

[40 marks]

*Answer **all** the questions in this section. All questions carry equal marks.*

1. (a) (i) Draw the multiplication $\otimes$ table in modulo 9 on {2, 3, 7, 8}.

(ii) Use the table to find the truth set of $8 \otimes m = 2$.

(b) Consider the following statements:

X: All policemen wear uniform;

Y: Civil servants do **not** wear uniform.

If *P* = {policemen}, *T* = {people who wear uniform} and *C* = {civil servants},

(i) draw a Venn diagram to illustrate *X* and *Y*;

(ii) use the Venn diagram to determine which of the following implications are **valid** or **not valid** conclusions from *X* and *Y*:

(α) Adu wears uniform $\Rightarrow$ Adu is a policeman;

(β) Ofei is a policeman $\Rightarrow$ Ofei is **not** a Civil Servant.

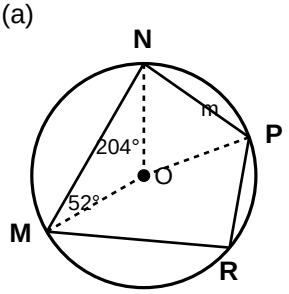
2. (a) Given that $p = \frac{(q - t)}{(t + 1)}$,

(i) Make *t* the subject of the relation.

(ii) Find the value of *t* when $p = \frac{2}{3}$ and $q = \frac{3}{4}$.

(b) Given that $m = \frac{2x}{(1 - x^2)}$ and $n = \frac{2x}{(1 + x)}$, express, in simplest form, $(2m - n)$ in terms of *x*.

3. (a)

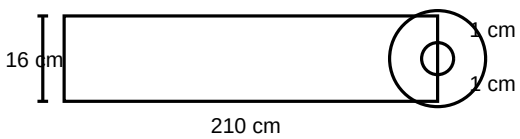


NOT DRAWN TO SCALE

In the diagram is a circle *MNPR* with centre *O*. The reflex angle at *O* is 204°. $\angle NMO = 52°$. Find the value of *m*.

(b) A ladder of length 6.5 m leans against a vertical wall. If the top of the ladder is 3.6 m from the foot of the wall, calculate, correct to **two decimal places**, the distance from the wall to the foot of the ladder.

4. (a)



NOT DRAWN TO SCALE

The diagram is a cylindrical pipe with length 210 cm. It has external diameter of 16 cm and is 1 cm thick. Find the volume of the metal used in constructing the pipe. [Take $\pi = \frac{22}{7}$]

(b) The coordinates of the points M and N are (5, –7) and (0, 5), respectively. Calculate the distance between M and N.

5. Two dice are thrown together once. Find the probability of obtaining:

(a) an odd number on the first die and 6 on the second;

(b) a number greater than 4 on each die;

(c) a total of 9 or 11.

SECTION B

[60 marks]

*Answer **five** questions only from this section. All questions carry equal marks.*

6. In a military camp, 50 officers had a choice of beans, plantain and rice. Of these officers, 21 chose beans, 24 plantain and 18 rice. Also 3 chose beans only, 9 plantain only, 2 rice only and 5 chose all three kinds of food.

(a) Illustrate the information on a Venn diagram.

(b) Use the Venn diagram to find the number of officers who chose:

(i) plantain and beans only;

(ii) exactly two kinds of food;

(iii) none of the three kinds of food.

7. (a) Copy and complete the table of values for the relation $y = 4 + 3x - 2x^2$, for $-4 \leq x \leq 4$.

x	–4	–3	–2	–1	0	1	2	3	4
y			–10		4		2		

(b) Using a scale of 2 cm to 1 unit on the x-axis and 2 cm to 5 units on the y-axis, draw the graph of the relation $y = 4 + 3x - 2x^2$, for $-4 \leq x \leq 4$.

(c) Using the graph, find the:

(i) equation of the line of symmetry of the curve;

(ii) maximum point of the curve;

(iii) values of x for which y decreases as x increases.

8. (a) A solid metal cylinder of height 6 m and diameter 28 cm is melted and recast into smaller solid cylinders. Each of the smaller cylinders is 14 cm high and 0.5 cm in diameter. How many smaller cylinders were obtained? [Take $\pi = {}^{22}/_{7}$]

(b) The unit digit of a two-digit number is 1 less than the tens digit. If the number is increased by 8 and then divided by the sum of the digits, the result is 8. Find the number.

9. (a) The ratio of cars to motorcycles sold at a garage is 5 : 7. If a dealer sold 142 more motorcycles than cars in a particular month, find the number of each type of vehicle sold.

(b) The probabilities of an athlete winning two independent events are ${}^{3}/_{5}$ and ${}^{2}/_{9}$. Find the probabilities of winning:

(i) only one event;

(ii) none of the events.

10. (a) A cyclist sets out from a town P on the bearing of 060° to a town Q, 5 km away. He then moves on the bearing of 345° to a town R, 6 km from Q.

(i) Represent the information on a diagram.

(ii) Calculate, correct to two decimal places

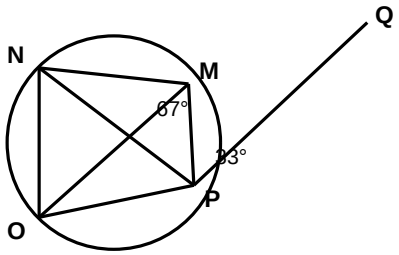
(α) $|PR|$;

(β) the bearing of R from P.

(b) The following are arranged in order of size: $(x - 2)$, 4, $(x + 2)$, $(2x + 1)$ and 9. If the median is equal to the mean, find the value of x.

11. (a) The average mass of refuse generated in a community in a week contains 35% plastic, 27.5% liquid, 17.5% metal, 12.5% vegetable matter and others 7.5%. Draw a pie chart to illustrate the information.

(b)



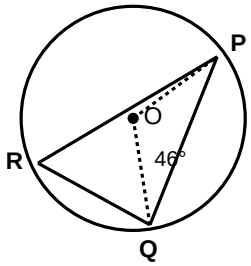
NOT DRAWN TO SCALE

In the diagram PQ touches the circle $MNOP$ at P and NP is a diameter. $\angle MPQ = 33°$ and $\angle PMO = 67°$. Find:

(i) $\angle MNO$;

(ii) $\angle MPO$.

12. (a)



NOT DRAWN TO SCALE

In the diagram, PQR is a circle with centre O. If $\angle RQO = 46°$, find $\angle RPQ$.

(b) A train is scheduled to cover a distance of 120 km at a certain average speed, r. Due to some technical challenges the average speed is reduced by 5 km/h thereby increasing the scheduled time by 20 minutes. Find the average speed, r.

13. (a) A function g is defined on the set of real numbers, ■, by

$g(x) = \frac{(1 + 3x)}{(x - 1)}$, $x \neq 1$. Find the:

(i) image of -1 under the function g;

(ii) value of x for which $g(x) = 7$;

(iii) value of $g(-3)$.

(b) The sum of the first ten terms of an Arithmetic Progression (A.P.) is 120. If the fifth term is 6 less than the eighth term, find the:

(i) common difference;

(ii) first term.

END OF PAPER